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Cariboo Forest Region, BC

STRUCTURAL DEFINITIONS FOR MANAGEMENT OF MULE DEER WINTER RANGE HABITAT IN THE INTERIOR DOUGLAS-FIR ZONE

INTRODUCTION

Maintaining good quality winter habitat for mule deer is a priority management goal for areas identified as mule deer winter range in the Cariboo-Chilcotin Land Use Plan (CCLUP). A large proportion of these winter ranges occur in the Interior Douglas-fir Biogeoclimatic Zone (IDF) where multi-storied Douglas-fir forests provide optimal forest structure to meet the food and shelter requirements of deer. The "Handbook for Timber and Mule Deer Management Co-ordination on Winter Ranges in the Cariboo Forest Region" (Mule Deer Handbook) describes the amounts of high, moderate and low crown closure habitat required on winter ranges in various snowpack zones. The Mule Deer Handbook also describes a low-volume partial cutting prescription that maintains stand structure attributes for mule deer habitat. This extension note introduces refined definitions for mule deer habitat classes in the IDFdk3 and IDFxm, using basal area to describe target stand conditions. This new way of defining habitat characteristics at the stand level is intended to provide clear, results oriented guidance for silviculturists developing uneven-aged stand prescriptions on IDF mule deer winter ranges.

DIFFERENT HABITAT DESCRIPTORS FOR DIFFERENT PLANNING LEVELS

Successful co-ordination of timber and mule deer management objectives requires planning efforts at three scales: regional, landscape and stand. The different requirements for each planning level result in the need for different sets of descriptive attributes. Increasingly precise descriptions of habitat attributes are both required and possible as the scale of interest changes from regional to landscape to stand. The variables used to describe the low, moderate and high crown closure habitat

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classes in the Mule Deer Handbook are best suited for regional scale analysis using the forest inventory data base. While these same habitat classes are used at the landscape and stand scales, new habitat descriptors have been developed for use at these larger scales. The stand level is where silviculturists develop prescriptions for individual stands. It is at this level that the desired stand attributes must be most precisely described so that the residual stands resulting from forest harvesting meet both deer habitat and silviculture objectives. Table 1 documents the characteristics used to describe the habitat classes at each planning scale. In this extension note, we refer to these classes as habitat classes rather than crown closure classes, as crown closure is not used as a defining attribute at the stand level.

TABLE 1. Numerical descriptors used at different scales for describing mule deer winter range habitat classes in the Cariboo Forest Region.

Planning Level/ Use	Numerical Descriptors
Regional - Regional land use planning and Mule deer strategy	• Crown closure. • Age class • Height class • % Douglas-fir
Landscape - Winter range mapping and management planning	• Crown closure • Large tree density • % Douglas-fir
Stand - Field Prescriptions	• Total basal area • Basal area >37.5 cm dbh • % Douglas-fir • BDQ or other stand structure description

MANAGEMENT OF THE ENTIRE WINTER RANGE AS A BIOLOGICAL UNIT

The Mule Deer Handbook encourages management of each winter range as a biological unit, consisting of a mosaic of habitats. This mosaic must be designed to meet the various needs of deer in the different snow and temperature conditions that occur within a single winter and over many different winters. In order to co-ordinate management for both timber and habitat goals, the proportion, size and arrangement of various habitat types need to be planned and managed through time. Therefore, stand level decisions about harvest timing and prescriptions need to be made in the context of overall winter range goals and current overall winter range conditions. The Mule Deer Winter Range Strategy prepared for the CCLUP has provided a very broad, strategic analysis of the current habitat condition and short-term harvest opportunities for each winter range in the Cariboo Forest Region. The CCLUP integration report has recommended the development of management plans for each winter range to provide more specific direction on habitat and timber objectives, based on more precise data than was used in the regional strategic analysis. These plans will describe where to apply each of three types of stand structure objectives and provide guidance on the timing and location of silviculture treatments designed to meet habitat and timber objectives.

The remainder of this extension note is focused on the description and use of new stand level definitions of mule deer habitat using total stand basal area and basal area of larger trees. These definitions are designed to provide clear, simple guidance on stand structure goals which will allow foresters to prescribe treatments that move stands towards these goals over time.

STAND LEVEL ATTRIBUTES FOR WINTER RANGE HABITAT TYPES

As described in the Mule Deer Handbook, low-volume partial cutting using a selection silvicultural system, is the recommended approach for management of Douglas-fir stands on mule deer winter range. The Handbook makes harvesting recommendations about topographic distribution of stems, diameter distribution, species selection, and degree of clumpiness. Table 2 summarizes this qualitative guidance and provides new

TABLE 2. Residual basal area targets for mule deer winter range stands in IDFxm and IDFdk3 Biogeoclimatic units in the Cariboo Forest Region These are minimum basal area targets for the Douglas-fir stand component at the beginning of the cutting cycle. For table values to apply, the cutting cycle must be at least 30 years. The residual basal area targets are the average for the net harvested area which does not include roads, landings or Wildlife Tree Patches. Two recommendations are given for moderate habitat in IDFxm: (A) for warm aspect stands with slopes ≥30%, (B) for all other stands.

Habitat Class	Biogeoclimatic Unit	Minimum Residual Basal Area Immediately Post Harvest		Other Criteria Applicable to All IDF Zone Mule Deer Winter Range Prescriptions
		Total Basal Area ≥12.5 cm. (m^2/ha)	Basal Area in stems ≥37.5 cm. (m^2/ha)	
Low	IDFxm and IDFdk3	≥16	≥6	• Create canopy gaps 0.3-1 tree height, averaging 0.5 • Minimize residual damage
Moderate	IDFxm (A)	≥22	≥8	• Harvest non-fir species first
	IDFxm (B)	≥22	≥11	• Maintain clumpy stem distribution
	IDFdk3	≥22	≥11	• Distribute harvest in relation to micro-topography
High	IDFxm	≥27	≥15	• Maintain or promote multi-storied stands
	IDFdk3	≥29	≥16	

Note: Special recommendations are provided for warm, steep slopes in the IDFxm because these sites are common and because good habitat mangement will require that some of them be managed as moderate crown closure habitat even though they may not be capable of being managed with a residual large tree basal area of 11 m^2/ha. Warm slopes >60% will only have the capability to produce low crown closure habitat.

quantitative basal area targets for high, moderate and low habitat classes within two biogeoclimatic units of the Interior Douglas-fir Zone in the Cariboo Region. The targets include both a total stand basal area and a basal area of trees greater than 37.5 cm at breast height. These targets are stated in terms of residual basal area, which is the basal area at the lowest point in the uneven-aged management cycle, i.e. immediately after harvest. Basal area is a good stand level descriptor of winter range habitat types because it correlates well with snow interception, is useful for describing diameter distribution targets including large trees, and is easy to measure using standard techniques. It is also well suited for development of uneven-aged harvesting prescriptions by silviculturists. These basal area targets were developed based on extensive data collection and experience in IDF stands. They are designed to be achievable and to maintain structural characteristics required by deer in winter.

TIMBER HARVEST PRESCRIPTIONS FOR WINTER RANGE HABITAT TYPES

The first step in developing a harvesting prescription for a stand on mule deer winter range is to determine the long-term habitat class objective for the stand. Winter range plans will provide guidance for this determination, taking site capability into account. In cases where winter ranges do not currently meet long-term habitat objectives, management plans may recommend other limitations to harvesting prescriptions as a transition strategy.

Once the habitat class objective is determined, the basal area targets from Table 2 can be used to develop the appropriate residual stem density and basal area curves.

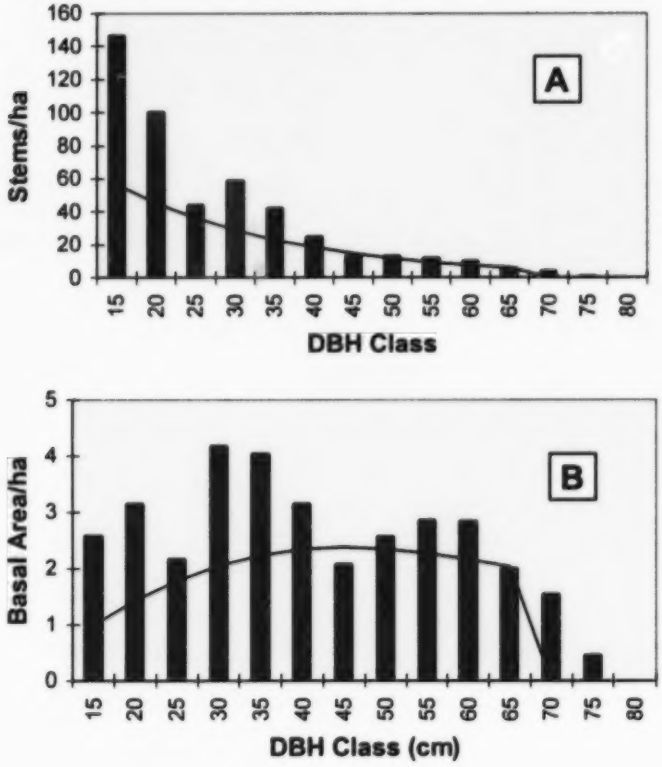

FIGURE 1. Example residual stand structure goals for a mesic IDFdk3 stand on a mule deer winter range. The graphs show stem density (A) and basal area (B) by diameter class. The bars indicate the current stand structure while the lines running through the bars represent the residual stand structure target. The target stand on these graphs is the moderate habitat type. Minimum basal area to be left = 22 m^2/ha, maximum diameter = 65 cm., stand structure goal q=1.25, large tree basal area reserve = 0 m^2/ha.

These curves are called "residual" curves because they are intended to describe the minimum density or basal area remaining immediately after harvest. Therefore, the average basal area over the cutting cycle will be higher than the stated minimums. The basal area will fluctuate between a low immediately after harvest to a high at the end of the cutting cycle. Superimposing a target residual basal area curve over a bar graph of the current stand produces a management tool for evaluating current stand conditions and assessing possible harvesting opportunities. Figure 1 provides an example. The bars in these graphs represent the current density and basal area in a mature Douglas-fir stand in the IDFdk3. This example stand has been designated for management as moderate crown closure habitat. The curved line through the bars represents a stand which meets the minimum basal area requirements for moderate crown closure habitat and provides a balanced diameter distribution required for habitat and silvicultural considerations.

After the residual basal area curve for a given stand has been defined, the silviculturist can develop a long-term approach to move the stand towards the target basal area distribution. Once this distribution is attained, the stand can then be harvested down to the minimum basal area curve at each harvest entry. This allows

the stand to continuously maintain the basal area at or above minimum targets. The example stand currently has a total basal area of 34 m^2 and a basal area of stems >37.5 cm of 17 m^2, so at this time, it exceeds the minimum targets for both moderate and high habitat classes. The stand diagrams reveal several possible harvest regimes. One possibility would be to simply harvest in the size classes above the line at the intensity needed to remove the excess stems while maintaining the required total basal area and basal area in stems greater than 37.5 cm.

Another possibility would be to bring the stand toward the target condition over two cutting cycles. The first pass would be a "thinning from below" of the pole-sized trees from 12-35 cm in diameter. This cut would remove the large excess of pole-sized trees and reduce competition amongst residual trees resulting in increased volume and crown growth on the residual trees. Some incidental harvest of larger trees may result from skid road development. The second pass, 20-40 years later, would harvest trees above the curve in all size classes in the standard clumpy pattern. This second pass would bring the stand to its target stand structure and promote regeneration under the newly created canopy gaps.

Various combinations of current stand structure and stand structure objectives will require different management regimes. However, once the long-term stand structure goals for a given stand are set, the silviculturist can develop a rational and measurable management path to meet both habitat and silviculture goals over time.

STAND STRUCTURE CURVES

The Correlated Guidelines for Management of Uneven-aged Drybelt Douglas-fir Stands in British Columbia - Appendix 1, (1992) gives a complete and easy to follow explanation of a common method for development of uneven-aged stand structural curves. Residual stand structure is described using three variables: "B" is the residual stocking goal, "D" is maximum diameter and "q" is the diameter distribution goal. Once the habitat type objective has been determined for a stand, the BDq approach can be used to develop long-term stand structure goals. The residual basal area requirements for each crown closure habitat class, from Table 2, can be used to set the residual stocking goal (B). We recommend choosing a relatively low q value to provide a relatively flat curve

TABLE 3. Recommended values for development of residual stand curves for managing mule deer habitat in IDFxm and IDFdk3 biogeoclimatic units in the Cariboo Forest Region. Two recommendations are given for moderate habitat in IDFxm: (A) for warm aspect stands with slope ≥30%, (B) for all other stands. Combinations of various levels of B, D, q and the large tree reserve can produce a wide range of residual stand curves to meet the mule deer habitat requirements described in Table 2.

Habitat Class	Biogeoclimatic Unit	Recommended values defining residual stand curves			
		B (m^2/ha, ≥12.5 cm)	D (cm)	q (using 5 cm dbh classes)	Large Tree Reserve (m^2/ha, ≥40 cm)
Low	IDFxm and IDFdk3	≥16	≥50	1.25 - 1.4	0 - 1.6
Moderate	IDFxm (A)	≥22	≥55	1.25 - 1.4	0 - 2.0
	IDFxm (B)	≥22	≥60	1.25 - 1.35	0 - 2.2
	IDFdk3	≥22	≥60	1.25 - 1.35	0 - 2.2
High	IDFxm	≥27	≥65	1.2 - 1.35	0 - 2.7
	IDFdk3	≥29	≥70	1.2 - 1.35	0 - 2.9

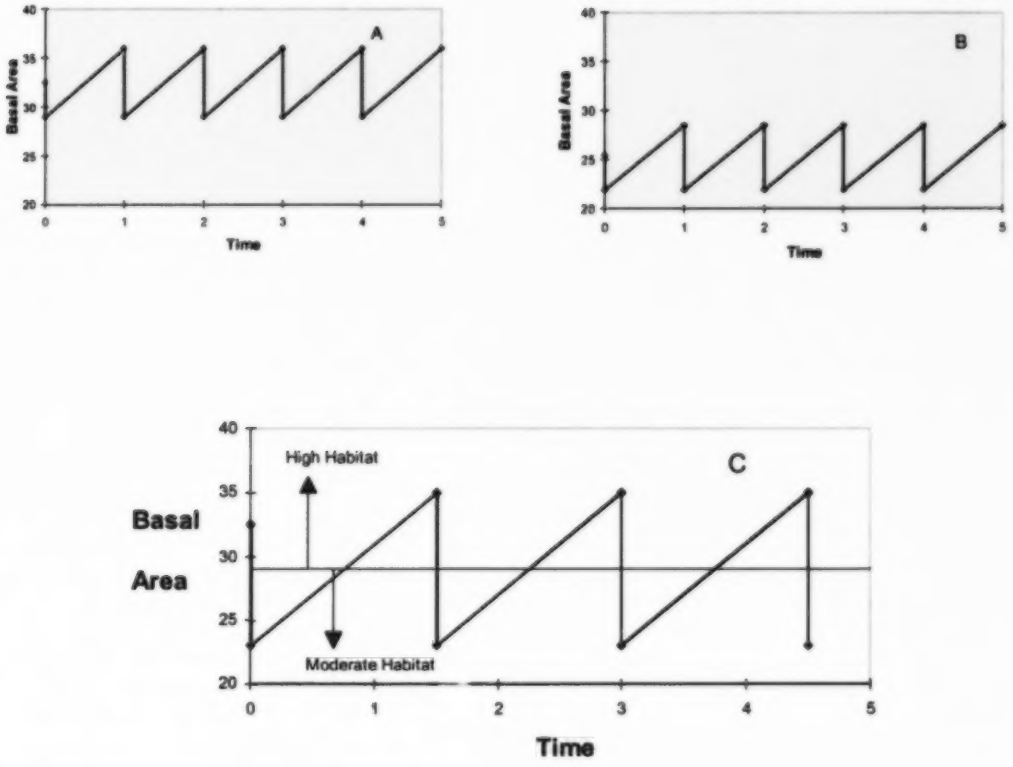

FIGURE 2. Three different timber harvesting regimes on mule deer winter range. Graphs (A) and (B) show the basal area trajectory for two different stands, one managed to remain continuously in high habitat (A) and the other to remain continuously in moderate habitat (B). The stand in (C) alternates between high and moderate using a longer cutting cycle. Under current management plans, regime "C" should be used only in areas with a long-term habitat objective of moderate.

with a higher proportion of larger trees. The maximum diameter (D) should be chosen to ensure that the recommended large tree minimums from Table 2 are met. ***Recommended ranges of B, D and q values for the three habitat classes are provided in Table 3.***

It is also possible to include a large tree "reserve" outside of the residual stand structure defined by the BDq curve. This "reserve" would maintain a small component of trees larger than "D", scattered throughout the stand, in addition to those defined by the basic residual stand structure curve. These larger trees do not count towards meeting the total basal area targets in table 2, but could be used to contribute to targets for Douglas-fir stems greater than 37.5 cm. This could allow the use of a lower value for the maximum diameter, "D", while still meeting the large tree basal area requirement. For example, the residual stand definition for the moderate habitat class could be met as shown in Figure 1 with a maximum diameter "D" of 65 cm with no large tree basal area reserve. Alternatively, the moderate definition could be met using a "D" value of 55 cm and a large tree reserve of 1.5 m^2 of basal area. Allowing a certain density of larger trees to

"escape" beyond the chosen value of D may be important in managing stands for other biodiversity values.

LONG-TERM MANAGEMENT OPTIONS

The dynamics of long-term habitat and timber management on IDF winter ranges are related to length of cutting cycle and volume or basal removal per entry. Higher volume removals require a longer cutting cycle and vice versa. Figure 2 shows two different ways of managing for high and moderate habitat. Graph A and B show two stands that are continuously maintained in either a high or moderate habitat respectively. Graph C shows a stand which alternates between moderate and high habitat using longer cutting cycles and higher volume removals. Current management planning allows for the use of the approach described in graph C only in areas zoned with a long-term objective of moderate habitat class. This ensures that the areas zoned for high habitat are consistantly maintained as high through time.

SUMMARY

Using the stand structure recommendations provided in Tables 2 and 3, silviculturists should be better equipped to develop and monitor uneven-aged forest management regimes which integrate timber and mule deer habitat requirements. This extension note has been updated from the original January, 1999 version to reflect comments and experience to date. Further comments and suggestions from foresters and habitat managers working with these recommendations are welcome.

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